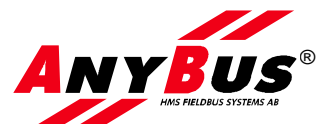# USER MANUAL
ANYBUS®
EVALUATION BOARD

DOC. NO. ABSEVB-UM-4.0E

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Revision Notes

Index	Date	Chapter	Autor	Revision	Revision note
1	2001-05-05	All	Mat	1.0	Build
2	2001-11-13	4.4	Mat	2.0e	Sample code corrected
3	2002-01-25	All	Mat	3.0e	Extended Functionality added
4	2004-05-10	All	Mat	4.0e	Rebuild for FW-version 4.0

Preface

This document describes the technical features and usage of the AnyBus-S/M Evaluation Board. The Evaluation Board allows you to set up a complete development environment for creating applications which use the AnyBus-S/M Modules and/or other AnyBus products. The Evaluation Board is supplied with the Keil μVision2 Development Tool, which allows you to test and debug program code that you have written. The Evaluation Board is suitable for AnyBus-S/M parallel modules, AnyBus-S serial modules, AnyBus IC and AnyBus Communicator/ComAdapter. Support for further AnyBus products is being developed.

> **!** **Please refer to the appendix for a list of supported AnyBus-S/M modules.**

The information and illustrations in this document are not binding. HMS reserves the right to make modifications and changes if necessary.

HMS is not responsible for errors which are caused by incorrect information in this document.

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Table of contents

1. Introduction

Please contact our technical support department if you have any technical questions. Please refer to the end of the appendix of this document for the address. The appendix also contains a feedback form which you should use if you have any suggestions for improving this product.

1.1 Scope of delivery

Designation	Description
AnyBus-S Evaluation Board	Development board for inserting an AnyBus-S/M module, AnyBus-IC or connecting to serial devices. The board contains firmware (EPROM) to allow the AnyBus-S/M Evaluation Board PC based Keil μVision2 Development Tool to communicate with the AnyBus-S/M module.
Serial 1:1 cable	D-SUB9 socket <–> D-SUB9 plug
AnyBus-S Evaluation Board CD-ROM	Contains: Example software, tools and other support equipment for development of embedded AnyBus-S/M environments
Keil Development Tools CD-ROM	Contains: μVision2 Development Tool, evaluation version (limited to 2k program code) Data sheets for the μC (80XXX)

1.2 System requirements

Part	Requirement
IBM Compatible PC	min. Pentium I with 100 MHz, 32MB RAM, free RS232 Port with D-SUB9 m
Operating System	Windows 9X,ME,NT,2000,XP
Power Supply	5V DC, 800mA
AnyBus Fieldbus Module	AnyBus-S/M parallel; AnyBus-S serial; AnyBus ComAdapter; AnyBus-IC (only over additional hardware); AnyBus-Communicator

1.3 Related documents

Name	Description	Document Number
AnyBus-S Design Guide Serial Interface	General Engineering information for In-Design of AnyBus-S using Serial Interface (SCI)	ABS-DESIGN-SER
AnyBus-S Appendix - Profibus	Data sheet for AnyBus-S Profibus-DP	ABS-APPENDIX-PDP
AnyBus-S Appendix - InterBus	Data sheet for AnyBus-S InterBus	ABS-APPENDIX-IBS
AnyBus-S Appendix - DeviceNet	Data sheet for AnyBus-S DeviceNet	ABS-APPENDIX-DEV
AnyBus-S Appendix - CANopen	Data sheet for AnyBus-S CANopen	ABS-APPENDIX-COP
AnyBus-S Appendix - ControlNet	Data sheet for AnyBus-S ControlNet	ABS-APPENDIX-CNT
AnyBus-S Appendix - Ethernet	Data sheet for AnyBus-S Ethernet	ABS-APPENDIX-ETN
AnyBus-S Appendix - Modbus Plus	Data sheet for AnyBus-S Modbus Plus	ABS-APPENDIX-MBP
AnyBus-S Shortform Datasheet	General Information of AnyBus-S	ABS-SHORTFORM

2. Hardware description

2.1 AnyBus-S Evaluation Board external
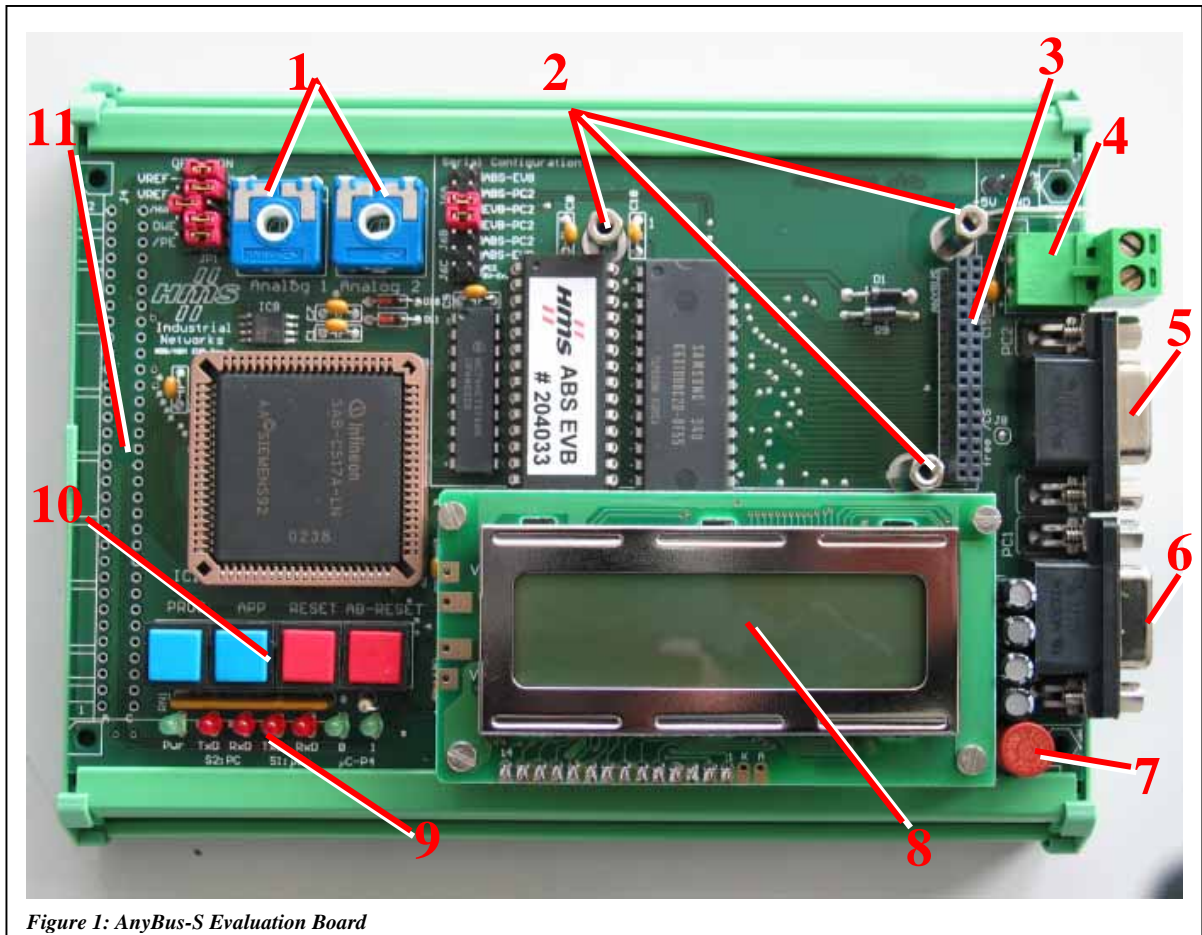
Figure 1: AnyBus-S Evaluation Board

1. **Potentiometer for Analogue values**

2. **Mounting pins for fixing a AnyBus-S/M module**

3. **Application connector for AnyBus-S Modules**

4. **Power supply connector (5V DC, 800 mA)**

5. **Serial connector for serial devices**

6. **Serial connector to PC**

7. **Fuse (250V, 800mA, T)**

8. **2*16 Character Display**

9. **Diagnosis & port LEDs**

10. **User switches**

11. **Expansion connector for own applications (optional)**

2.2 AnyBus-S Evaluation Board Circuit Diagram

Figure 2: Evaluation Board Circuit

2.3 Connectors

2.3.1 Power supply

The Evaluation Board must be connected to an external 5V/800mA power supply using a pluggable screw connector. A protection diode is provided to protect against polarity reversal. In addition, the Evaluation Board is protected against short circuits with an on-board fuse.
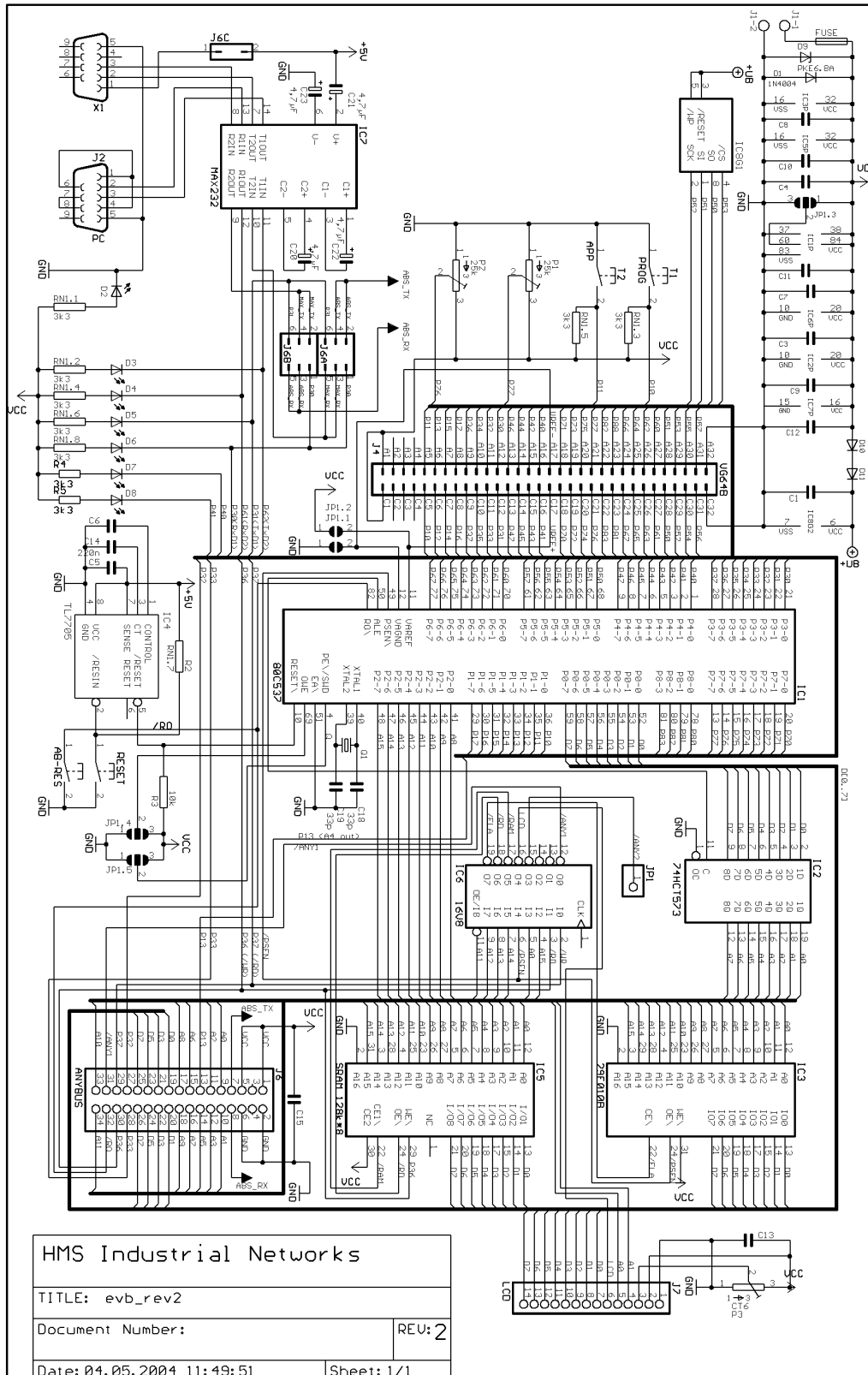**Please note that over voltage protection is not available. Over voltage will damage the device!**
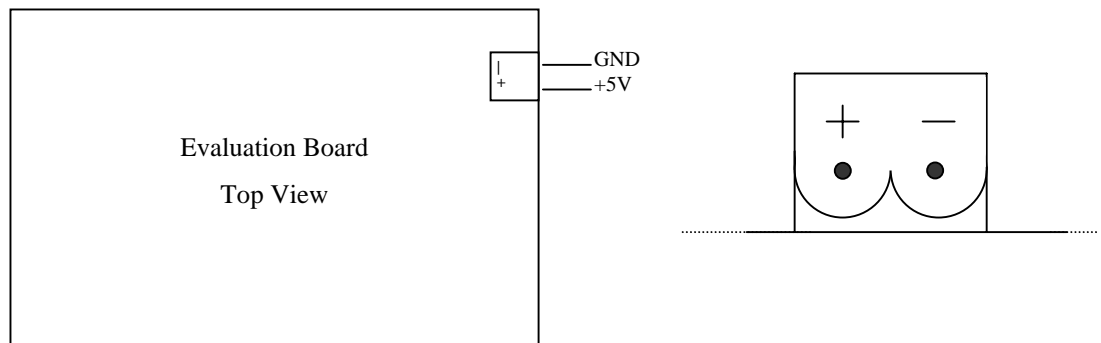

Figure 3: Position of power supply connector

2.3.2 PC Interface/PC1

A PC is required to test various initialization methods using the Keil C51 Evaluation Compiler/Debug software to test your applications and download them to the Evaluation Board. Further information on the Evaluation Board Development Toolkit and the Keil C51 Development Tool is contained in chapter 4.4.

The serial interface of the Evaluation Board is connected directly to a serial interface of an IBM compatible PC (COM1 – COM8) using the supplied cable. The RS232 interface already has crossed over Tx and Rx lines and thus the connection is made with a 1:1 cable. The following pins are used:

1. **RxD**   **(Pin 2)**
2. **TxD**   **(Pin 3)**
3. **GND**   **(Pin 5)**

Figure 4: Front view of D-SUB 9 PC connector

2.3.3 Interface for serial devices PC2

The Evaluation Board is connected to serial devices using a D-SUB9 connector. The RS232 interface already has crossed over Tx and Rx lines and thus the connection is made with a 1:1 cable. The following pins are used:
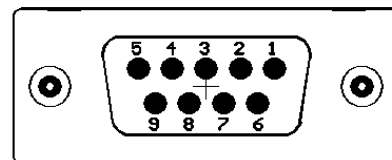
1. **RxD**   **(Pin 2)**
2. **TxD**   **(Pin3)**
3. **GND**   **(Pin 5)**
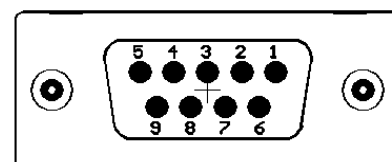4. **5V**   **(Pin 1, see chap.2.3.10)**

Figure 5: Front view of the D-SUB 9 PC2 connector

2.3.4 AnyBus-S Application Interface Connector

The AnyBus-S/M Application Interface Connector on the Evaluation Board is used to plug in the AnyBus-S/M module. The pin assignments are shown in following table:
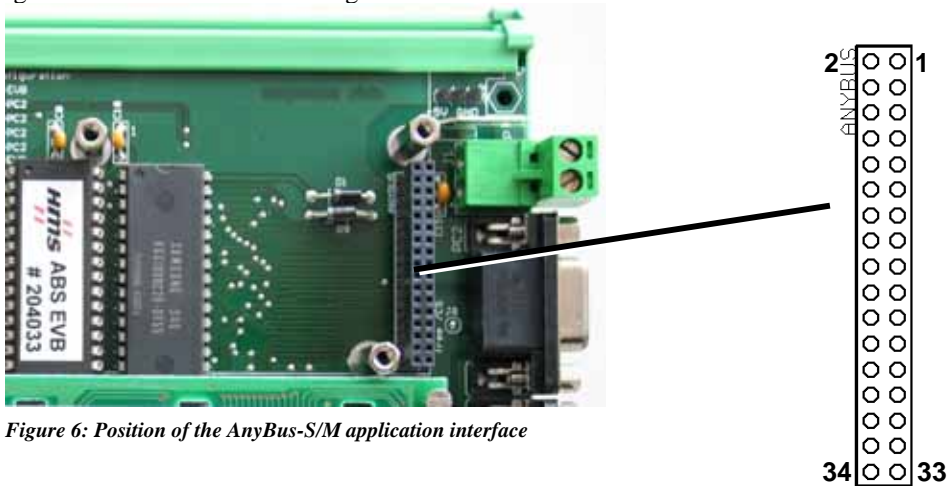

Figure 6: Position of the AnyBus-S/M application interface

Pin	Name	Description	Note
1	+5V	+5V	AnyBus Module power supply
2	GND	GND	"
3	-	NC	Not connected
4	-	NC	Not connected
5	+5V	+5V	AnyBus Module power supply
6	GND	GND	"
7	TX	Transmit	Serial interface (for firmware download). Internally pulled-up with 100 kΩ on the AnyBus-S module.
8	RX	Receive	Serial interface (for firmware download). Internally pulled-up with 100 kΩ on the AnyBus-S module.
9 - 18	A_0 - A9	Address line 0 - 9	Directly connected to the DPRAM. Pin 9 = LSB
19 - 26	D_0 - D_7	Data bit 0 - 7	Directly connected to the DPRAM. Pin 19 = LSB
27	/BUSY	Busy signal	Open collector output. Internally pulled-up with 10 kΩ on the AnyBus-S module.
28	/IRQ	Interrupt signal	Open collector output. Internally pulled-up with 10 kΩ on the AnyBus-S module.
29	/RD	Read signal	Active low input.
30	/WR	Write signal	Active low input.
31	/CE	Chip enable signal	Active low input.
32	/RESET	Reset signal	Active low input. Internally pulled-up with 35-75 kΩ on the AnyBus-S module.
33	A_{10}	Address line 10	Directly connected to the DPRAM. Internally pulled-up with 10 kΩ on the AnyBus-S module.
34	A_{11}	Address line 11	Directly connected to the DPRAM. Internally pulled-up with 10 kΩ on the AnyBus-S module. Enables 4K DPRAM access

2.3.5 Expansion Interface Connector for your own applications.

An extension interface is provided for connecting to your own hardware applications. It allows you to access all of the unused ports of the µC. The solder pads are designed for a standard DIN41612 edge connector, but you can also attach individual wires if required. In order to avoid damage to the Evaluation Board, it is important to observe the standard guidelines for soldering electronic components.
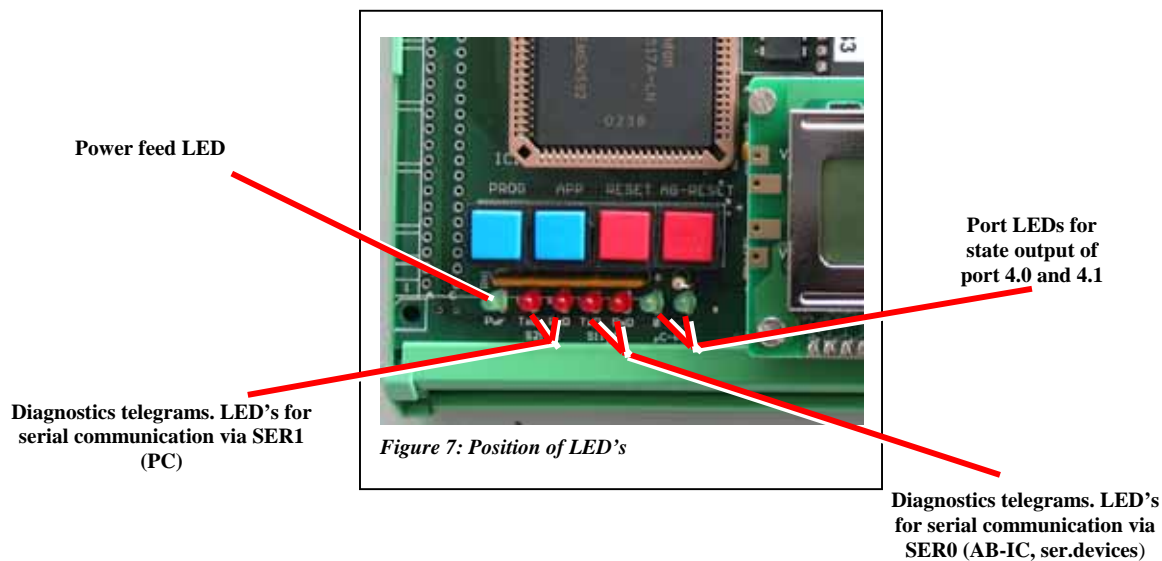
The pin assignments are shown in following table:

Number	Row A (bottom row)	Row B (upper row)
1	VCC	VCC
2	nc	nc
3	nc	nc
4	nc	nc
5	P1.1 / INT4 / CC1	P1.0 / INT3 / CC0
6	P1.3 / INT6 / CC3 / (ABS: Pin 13 A04)	P1.2 / INT5 / CC2
7	P1.5 / T2EX	P1.4 / INT2 / CC4
8	P1.7 / T2	P1.6 / CLKOUT
9	P3.6 / WR / (ABS: Pin 30 /WR)	P3.7 / RD / (ABS: Pin 29 /RD)
10	P3.4 / T0 / (ABS: Pin 27 /BUSY)	P3.5 / T1
11	P3.2 / INT0	P3.3 / INT1 / (ABS: Pin 28 /IRQ)
12	P3.0 / RXD0 / (ABS: Pin 7 TX)	P3.1 / TXD0 / (ABS: Pin 8 RX)
13	P4.6 / CM6	P4.7 / CM7
14	P4.4 / CM4	P4.5 / CM5
15	P4.2 / CM2	P4.3 / CM3
16	P4.0 / CM0	P4.1 / CM1
17	VREF_NEG	VREF_POS
18	P7.1 / AN1	P7.0 / AN0
19	P7.3 / AN3	P7.2 / AN2
20	P7.5 / AN5	P7.4 / AN4
21	P7.7 / AN7	P7.6 / AN6
22	P8.2 / AN10	P8.3 / AN11
23	P8.0 / AN8	P8.1 / AN9
24	P6.6 / Bi-directional I/O	P6.7 / Bi-directional I/O
25	P6.4 / Bi-directional I/O	P6.5 / Bi-directional I/O
26	P6.2 / Bi-directional I/O / TXD1	P6.3 / Bi-directional I/O
27	P6.0 / Bi-directional I/O / ADST	P6.1 / Bi-directional I/O / RXD1
28	P5.1 / CCM1	P5.0 / CCM0
29	P5.3 / CCM3	P5.2 / CCM2
30	P5.5 / CCM5	P5.4 / CCM4
31	P5.7 / CCM7	P5.6 / CCM6
32	GND	GND

2.3.6 LEDs

The Evaluation Board is provided with the following status and diagnostic LEDs:

Designation	Color	Description
Pwr	Green	Power feed to the Evaluation Board
S2:PC TxD	Red	Tx line for the PC interface (µC serial port SER1)
S2:PC RxD	Red	Rx line for the PC interface (µC serial port SER1)
S1:PC TxD	Red	Tx line for the serial AnyBus interface, (µC serial port SER0), used by AnyBus-S serial module or serial devices
S1:PC RxD	Red	Rx line for the serial AnyBus interface, (µC serial port SER0), used by AnyBus-S serial module or serial devices
µC-P4 0	Green	Directly connected to port I/O line 4.0 over pull down resistors. (High active)
µC-P4 1	Green	Directly connected to port I/O line 4.1 over pull down resistors. (High active)

The power LED indicates that the 5V DC power feed is present. The LED S2:TxD flashes when data is being sent to the PC. The LED S2:RxD flashes when data is received from the PC. The LED S1:TxD flashes when data is being sent to the ComAdapter. The LED S1:RxD flashes when data is being received from the ComAdapter. These LEDs are only for diagnostic purposes and cannot be controlled by your program. LED µC-P4 0/1 can be controlled by software.

Power feed LED

Port LEDs for state output of port 4.0 and 4.1

Diagnostics telegrams. LED's for serial communication via SER1 (PC)

Figure 7: Position of LED's

Diagnostics telegrams. LED's for serial communication via SER0 (AB-IC, ser.devices)

2.3.7 Push-buttons

The Evaluation Board is provided with four push-buttons as follows:

| Designation	Color	Number	µC/ABS/M signal	Description
PROG	Blue	T1	P1.0 (Pin 36) of the µC	Key function "Programming"
APP	Blue	T2	P1.1 (Pin 35) of the µC	Key function "Application"
RESET	Red	T3	Reset circuit for the µC. Controls /RESET on Pin 10 of the µC.	Triggers a hardware reset on the AnyBus-S Evaluation Board
AB-RESET	Red	T4	/RESET (Pin 32) on the AB-S/M /RO (Pin 82) on the µC	Triggers a hardware reset on the AnyBus-S/M module <u>only</u>
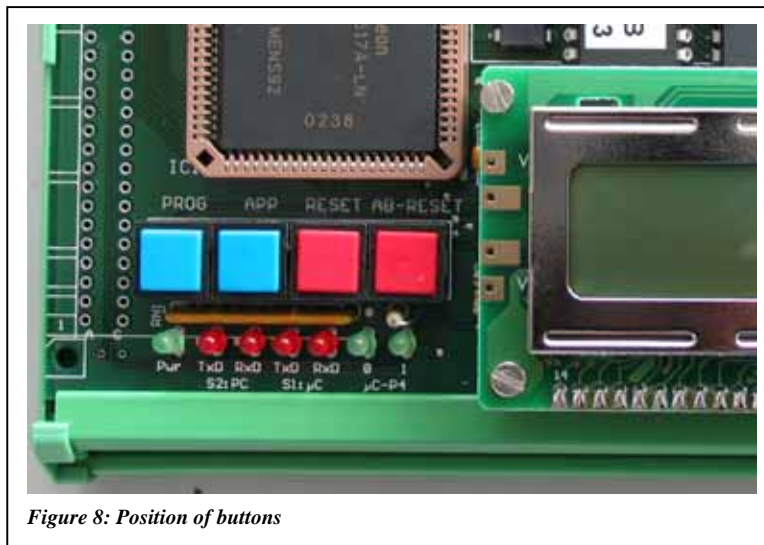
Figure 8: Position of buttons

The functions of each of the buttons and/or button combinations are described from chapter 4 onwards.

2.3.8 Potentiometers

The two potentiometers on the Evaluation Board are used to provide an analog signal for generating user data for data transmission. They are connected as potential dividers and the moving contact is connected to the µC. They can be connected across a fixed 5V supply or an external reference voltage source, depending on jumper settings (see chapter 2.3.10). When the potentiometer is turned, the output voltage varies between 0 V and the supply voltage. The µC contains an analog/digital converter which converts the analog input signal to an integer value between 0 and 255. The µC has a total of eight analog inputs which are connected as follows:

| µC Port-Pin	Expansion Port Pin	Potentiometer
P7.7	A21	Analog 1
P7.6	C21	Analog 2
P7.5	A20	-----------
P7.4	C20	-----------
P7.3	A19	-----------
P7.2	C19	-----------
P7.1	A18	-----------
P7.0	C18	-----------

2.3.9 Jumpers

The Evaluation Board is provided with jumpers which are used to configure the reference voltage source and three different controller hardware and seven interfaces features:

Description	Connected wires/pins				Meaning
		ON		**OFF**	
VREF-	A17 (Exp.Con.) Pin 12 (µC) GND		A17 (Exp.Con.) Pin 12 (µC)		**REF**erence **V**oltage - Enabling/disabling internal negative reference voltage ON: enabled OFF: disabled
VREF+	C17 (Exp.Con.) Pin 11 (µC) +5V		C17 (Exp.Con.) Pin 11 (µC)		**REF**erence **V**oltage + Enabling/disabling internal positive reference voltage ON: enabled OFF: disabled
/HWPD	Pin 60 (µC) GND		Pin 60 (µC) +5V		**H**ard**W**are **P**ower **D**own For the duration of one machine cycle while the oscillator is running resets the µC. Set to OFF at µC: SAB 80C517A
OWE	Pin 69 (µC) GND		Pin 69 (µC) +5V		**O**scillator **W**atchdog **E**nable Enables the oscillator watchdog. OFF: enabled ON: disabled
/PE	Pin 4 (µC) GND		Pin 4 (µC) +5V		**P**ower saving mode **E**nable Allows the software to enter the power saving modes (idle mode, slow down mode, and power down mode). OFF: enabled ON: disabled

Description	Jumpersettings	Meaning
ABS-EVB	ABS-EVB ABS-PC2 EVB-PC2 EVB-PC2 ABS-PC2 ABS-EVB PC2 5V-En	Connects the internal serial 5V UART-interface from µC directly with the 5V UART-interface from ABS/M. Both jumper must be set like described.
ABS-PC2	ABS-EVB ABS-PC2 EVB-PC2 EVB-PC2 ABS-PC2 ABS-EVB PC2 5V-En	Connects the internal serial 5V UART-interface from the ABS/ABM over an RS232 interface converter with the serial RS232 connector PC2. Both jumper must be set like described.
EVB-PC2	ABS-EVB ABS-PC2 EVB-PC2 EVB-PC2 ABS-PC2 ABS-EVB PC2 5V-En	Connects the internal serial 5V UART-interface from µC over an RS232 interface converter with the serial RS232 connector PC2. This setting can be used for firmware or configuration download. Both jumper must be set like described.
PC2 5V-En	ABS-EVB ABS-PC2 EVB-PC2 EVB-PC2 ABS-PC2 ABS-EVB PC2 5V-En	Enables the availibility of 5 Volts supply accessible from second serial SUB-D port (PC2).

Figure 9: Position of jumpers

Controller specific jumper for configuration of the different hardware settings.
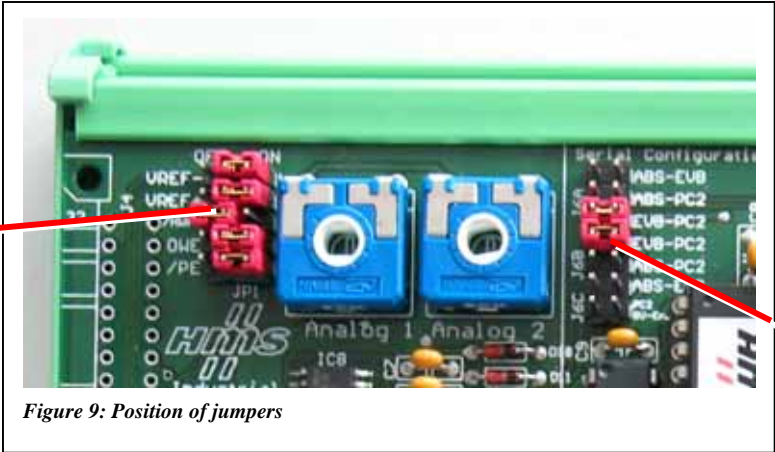
Communication specific jumper for configuration of the different serial interface connections.

Figure 9 shows the different controller specific and interface specific jumper blocks.

2.3.10 Power connector for external diagnostic devices

The Evaluation Board is provided with a connector with 2.45 mm pin spacing for feeding power to external diagnostic devices such as a logic pen. The power feed also passes through the on-board fuse. The pin assignments of the connector are as follows:

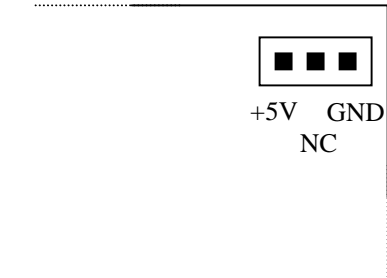| Pin	Description
+5V	Power Supply **+5 V**olts
NC	**Not Connected**
GND	**Gr**ou**nd**

+5V   GND
      NC

Figure 10: Position of power supply for ext. diagnostic devices

2.3.11 Additional PE connection

The Evaluation Board is provided with a 6.35mm x 0.8 mm spade connector for connecting to an external protective earth. This PE connection is directly connected to the PE mounting pin of the AnyBus module.

2.3.12 Fuse

The on-board fuse protects the electronic circuits in case of excessive current consumption. If the fuse fails, you must never bridge the connection in the fuse socket. If the power LED does not light when the power is connected, unplug the fuse and test it with an ohmmeter and replace if necessary. Component suppliers for the fuse are listed in the appendix.

Technical specifications of the on-board fuse:

250V; 800mA; slow

2.3.13 Display

The Evaluation Board is provided with a 2x16 character LCD. The information displayed depends on the operating mode. The display can be accessed by your own programs at an offset of E800h (see memory map). The LCD is operated in four bit mode on the system bus of the Evaluation Board.

The contrast of the LCD can be adjusted by the potentiometer below the display.

Pin assignments of the µC signals to the LC Display:

Pin	LCD-Pin description	Wired to Evaluation Board (µC)
1	GND	Internal wired with power supply . Contrast level via Potentiometer.
2	VCC	
3	Contrast	
4	RS	Wired by internal address logic with A0 (P0.0), A1 (P0.1), /PSEN.
5	RW	
6	EN	
7	DB0	Wired by internal address logic with D0-D7 (Port 0)
8	DB1	
9	DB2	
10	DB3	
11	DB4	
12	DB5	
13	DB6	
14	DB7	

! **If necessary, you can remove the LCD from the Evaluation Board and connect it using a cable of length < 10cm.**

However, you will lose the manufacturer's guarantee if you do this.

2.4 Memory map

The external memory of the µC on the Evaluation Board consists of 256k Byte RAM and 256 kByte ROM together with additional devices such as LCD and the AnyBus-S module. The internal address logic manages this memory and the memory areas of the connected external devices automatically.
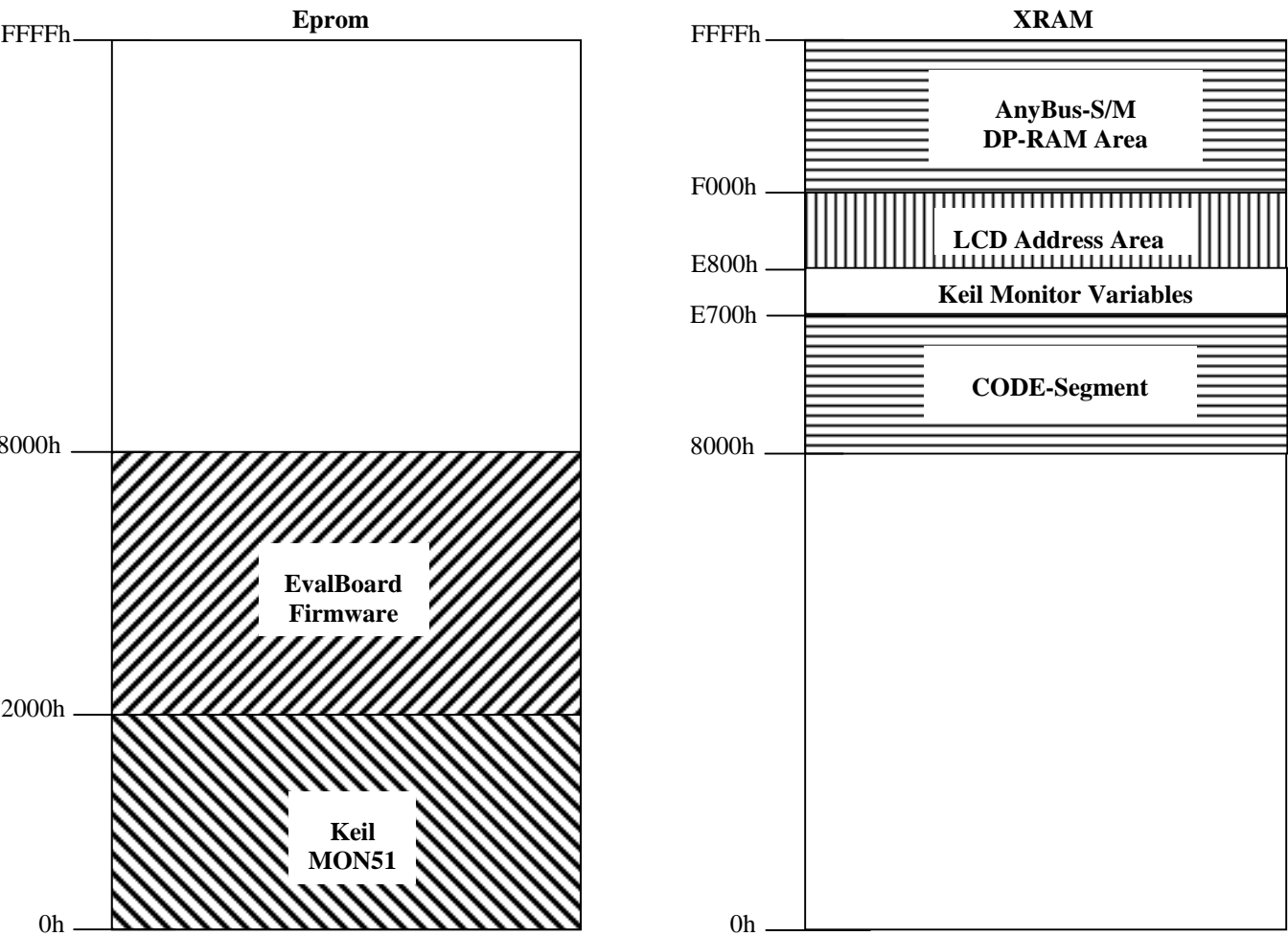

Figure 11: Memory Map

> ! Access to external devices such as the LCD and AnyBus-S module is described in the data sheets contained on the HMS CD-ROM.

2.5 Addressing external devices

In order to access the memory area of the AnyBus-S/M module, add an offset of F000h to the address of the AnyBus-S/M DP-RAM area.

Example:

Reading the AnyBus-S/M Fieldbus type"
Register address: 7CCh-7CDh

High byte of the „Fieldbus type" field = 7CCh + F000h (offset) = F7CCh
Low byte of the „Fieldbus type" field = 7CDh + F000h (offset) = F7CDh

The same applies to accessing the memory area of the LCD. The offset is E800h in this case. Accessing the LCD is described in the documentation for the LCD.

3. Developing with the Evaluation Board

3.1 Opening the case

In some cases, it may be necessary to remove the Evaluation Board from the case. To do this, you must remove one of the strips at the two ends. Remove the three cross head screws and slide the board out of the lower part of the case. Follow the reverse procedure to reassemble.

3.2 Connecting a hardware emulator

You can connect a hardware emulator to the Evaluation Board if necessary. The position of the µC on the Evaluation Board was chosen to ensure that it is not covered up by the LCD or the AnyBus-S/M Module. However, in some cases an additional adapter socket may be needed if the probe of the hardware emulator interferes with the AnyBus-S/M module or the LCD. It is also possible to connect an EPROM emulator. Sufficient space has been provided underneath the AnyBus-S/M module to allow you to make the connection. Two access holes are provided below the socket of the µC to allow you to remove the µC by pressing it out from below. It is first necessary to open the case.

> ! **The Evaluation Board uses two different µC types: SAB80C537; SAB80C517A**
> **Data sheets for the microprocessors can be found on the supplied Keil Development Tools CD-ROM.**

3.3 Connecting your own hardware applications

As described in chapter 2.3.6, the Evaluation Board is provided with an expansion interface connector for connecting your own hardware applications. The solder pads are designed for a standard DIN41612 edge connector, but you can also attach individual wires if required. If you want to fit a connector, it is necessary to open the case and remove the main board to get access to the bottom side of the board. In order to avoid damage to the Evaluation Board, it is important to observe the standard guidelines for soldering electronic components.

> ! **You will loose the manufacturer's guarantee if you modify the hardware of the Evaluation Board.**

4. Commissioning

The firmware of the Evaluation Board makes it easy to initialize the inserted AnyBus-S/M Fieldbus module. Initialization can be done in Plug&Play mode or each of the initialization functions can be carried out step by step in Monitor Mode (interactive mode) using the AnyBus-S Evaluation Board Toolkit. In addition, the supplied Keil Development Tool lets you create, compile, simulate and debug your own programs.

4.1 Easy StartUp initialisation (slave)

In Easy-StartUp mode you do not need to connect the Evaluation Board to a PC. This mode is entered automatically if the Evaluation Board is connected to the power supply with the AnyBus-S module inserted. After connecting the power, the LCD shows „RESET VX.X" where X.X is the firmware version.


1-5 seconds later the LCD shows a new screen for checking the module type: AnyBus-S or AnyBus-M.
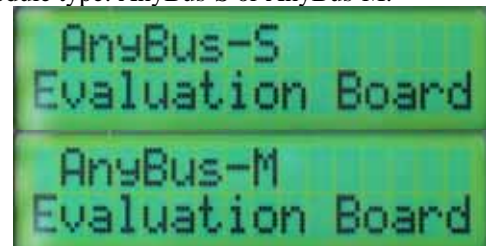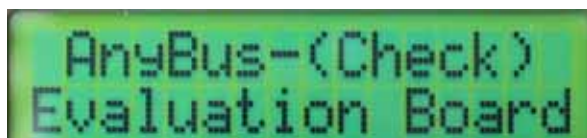
After a while a different screen will appear. This screen includes all modulespecific data:

The LCD shows the software number (at offset 7Ceh-7CFh), the serial number (at offset 7C8h-7C9h) and the fieldbus version (at offset 7CCh-7CDh) as HEX values or in plain text. Press the STEP button again to start the automatic initialization process. Each of the following screens are shown on the LCD for about 2-5 seconds. Easy StartUp automatically initializes the inserted AnyBus-S Module for 2 byte I/O.
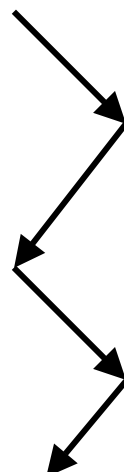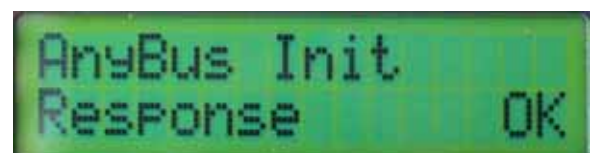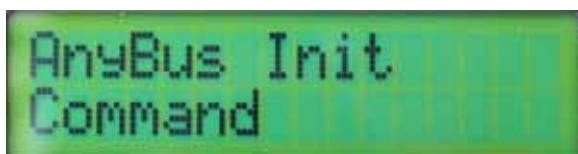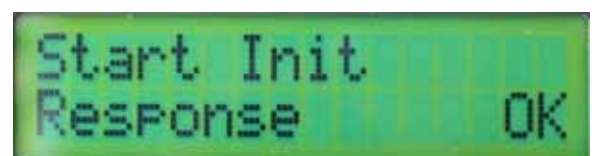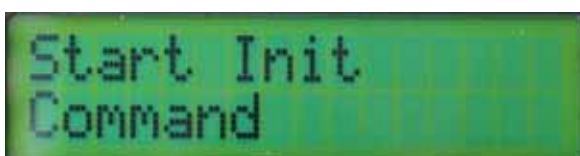
If all initialization stages are acknowledged successfully with OK, the Evaluation Board then proceeds immediately to data exchange mode. The module is now in data exchange mode and the initialized bytes are shown on the display. The top line DAT OUT shows all data sent from the Evaluation Board to the AnyBus module (which is then sent by the AnyBus-S module to the fieldbus). The lower line DAT IN shows all data received by the AnyBus-S module from the fieldbus (which is then sent by the AnyBus-S module to the Evaluation Board). The first two DAT OUT values correspond to the analog value from the potentiometers. This makes it easy to implement a slave for any required fieldbus system. For Fieldbus master replacement see our information about master simulators in chapter 5.

4.2 Easy StartUp Initialisierung (Master)

The difference between Master and Slave module will be shown if the initialisation has been finished. Ath a master module a new display will appear:
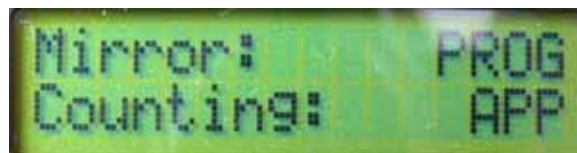
By choosing „Mirror" through key „PROG" the master will be instructed to mirror the data. This means all data from the input data area will be read and written back to the output area. At choice „Counting" through the „APP"-key a counter will sent out its decreesing value each 500ms from 0-255. If one of these chices are coosen the EVB asks for the data word that is affected and displayed.
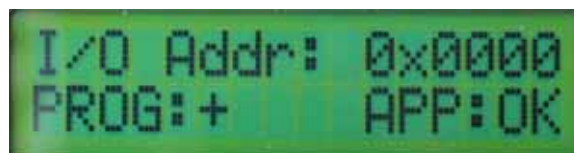
Through „PROG"-key the first byte position of the applicated data word will be choosen. Depending on Fieldbus system between 0 and 510 (DPV, DEV) or 0 and 62 Byte(ASI). Succeeding the highes value tha values starts at 0. Key "APP" will approf the setting.

Depending on the fieldbus system a different screen can appear, wich makes the master possible to change from run to config mode (only ASI ad DEV):

In order to change from config mode to run mode ist necessarry to reset the EVB together with the ABS/M module done by the "RESET" key:

4.3 Automatic recognition

It is also possible to recognize the connected AnyBus type automatically at "Easy StartUP phase". With this functionality it is possible to connect different AnyBus product families. The initialisation works similar to the described AnyBus-S initialisation and is completely controlled by menu.

Currently are following product families are supported by Evaluation Board's firmware:

- **AnyBus S with parallel interface**
- **AnyBus M with parallel Interface**

Complete hardware compatibility is guaranteed for following AnyBus products:

- **AnyBus-S with serial interface**
- **AnyBus-IC with serial interface**
- **AnyBus ComAdapter**
- **AnyBus Communicator**
- **AnyBus S with Drive Profile module**

> **!** **The display screens can differ at different firmware versions. Updates for firmware, Keil monitor program or GAL-listings are available at HMS GmbH (Germany)**

4.4 Keil monitor mode

The firmware of the Evaluation Board includes the C51 Monitor program from the Keil company, which makes it easy for you to evaluate and debug your own programs. You can then develop your own programs with the Keil C51 development environment, download them to the Evaluation Board and debug them. With certain limitations it is also possible to do this with the supplied Development Tool from the Keil company. Switch over to Keil C51 Monitor mode as follows:

1. **Press and hold down the RESET button.**

2. **Press and hold down the MONITOR button.**

3. **Release the RESET button.**
   The LCD should then show the following:

4. **Release the MONITOR button.**

The Evaluation Board is now ready to receive programs from the Keil µVision2 Development Tool. Information on installing the Keil µVision2 software is contained on the supplied Keil Development Tools CD-ROM. Several adjustments to the environment must be made before you can download your programs with µVision2:

1. **The file Startup.a51 must always be included in the project.**
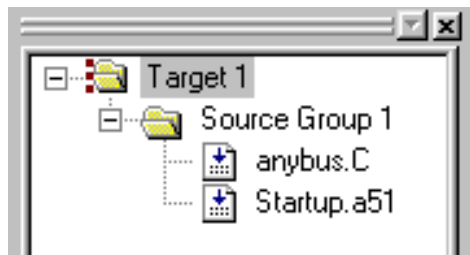
Figure17: Keil µVision2 Project Workspace window

2. **In the Startup.a51 file, change the line „CSEG AT 0000h" to „CSEG AT 8000h".**
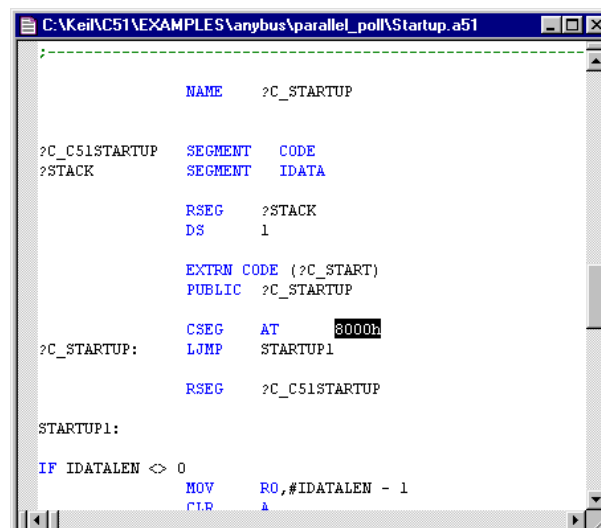
Figure 18: Keil µVision2 program code window

3. **Choose Project -> Options for Target 'XXXX' and change the oscillator frequency to 12 Mhz and the memory start address to 8000h.(other settings are free in the range <0xE700)**

Figure 12: Keil µVision2 Options / Target

4. **To download the program and/or to debug in the target hardware, it is also necessary to make the following settings in the Debug tab.**

Figure 20: Keil µVision2 Options / Debug

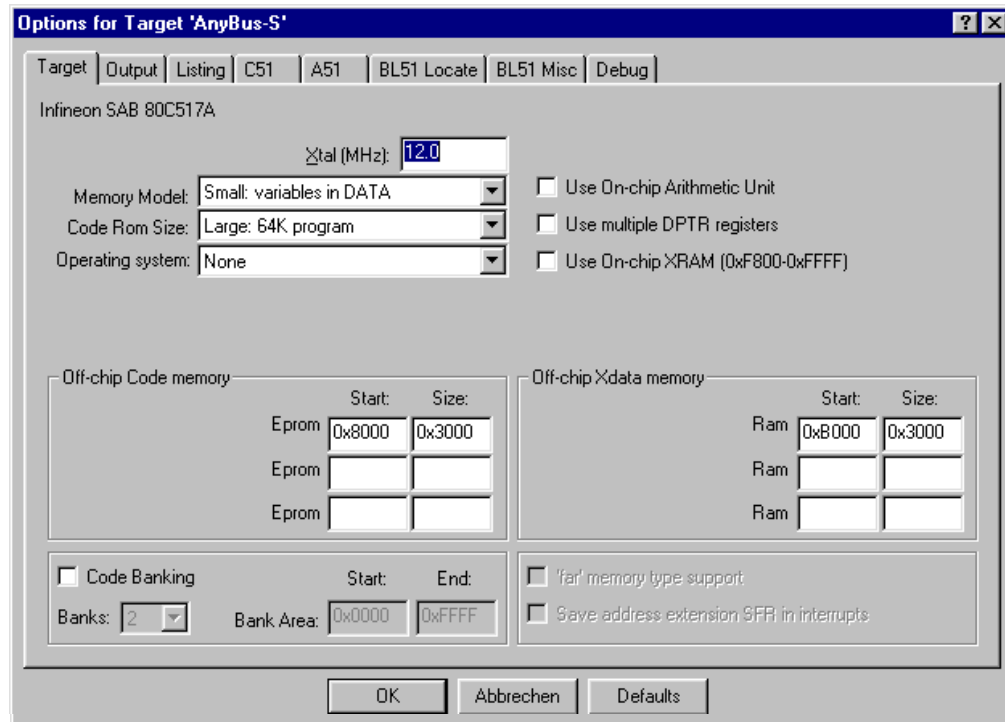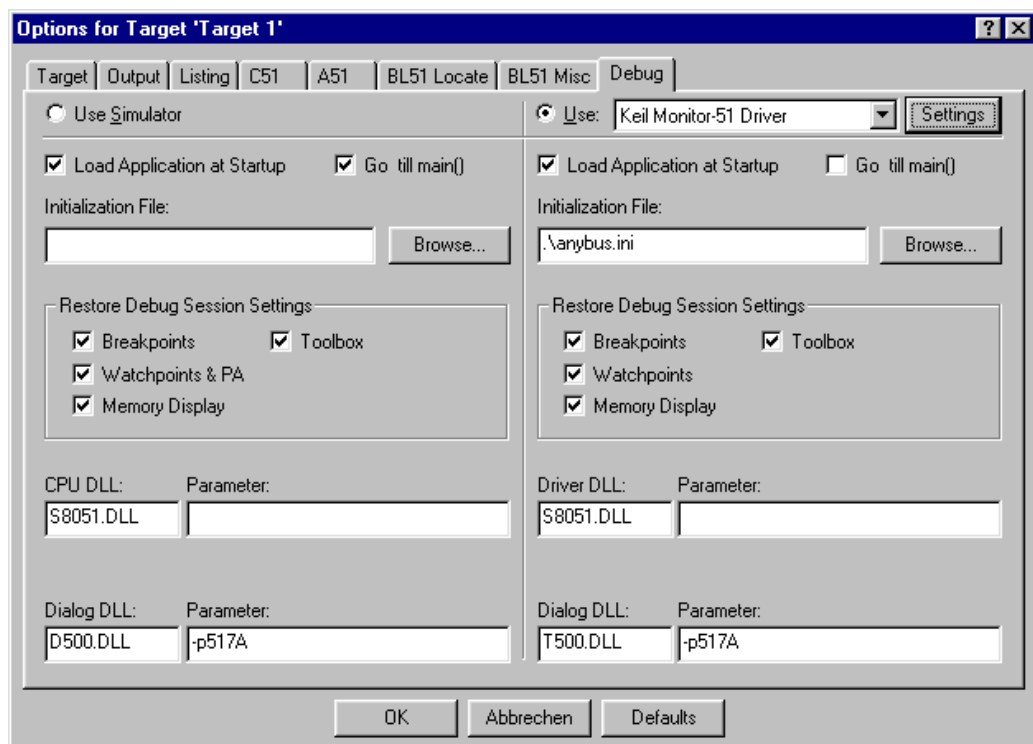5. Click the "Settings" button and set the baud rate for the software download to 9600 Baud. The monitor program requires a serial interrupt for trouble-free debugging. Please check the serial interrupt checkbox.
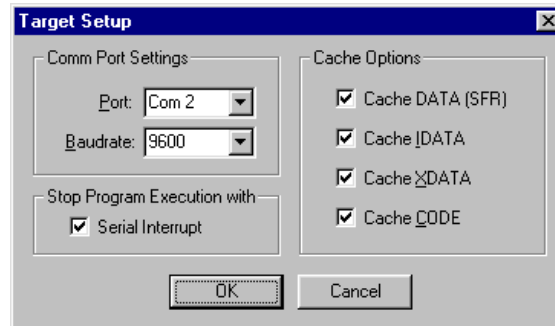
Figure 13: Keil µVision2 Target Setup

6. Choose the menu Debug -> Start/Stop Debug Session to download the program to the Evaluation Board. The contents of registers can then be inspected and the program can be executed step by step. Information on using the Keil µVision2 system is contained on the Keil Development Tools CD-ROM.

Figure 22: Keil µVision2 program upload to EvalBoard

! The supplied HMS AnyBus-S Evaluation Board CD-ROM contains a complete example project which you can load into the µVision2 Development Tool. This project is already configured for the Evaluation Board and no more settings are required apart from choosing the COM interface for the PC. To use this project, choose „Open Project" in the Project menu of µVision2 and choose the directory containing the example project. Projects can be stored in any directory. The file name of the example project is: **Anybus.Uv2**
The program can then be compiled, downloaded, executed and tested as described in Point 6, above.

4.5 Store own programs into Flash

Programs, which where downloaded through the Keil Software environment to the Evaluation Board are stored into the volatile memory, first. These programs are not available after a restart or power cycle. But they can be stored permanetly to the non-valatile flash memory. Therefore the keys „PROG" and „APP" must pressed simultaneous ond hold. In addition to these keys the„RESET" must be pressed and released. Afterwards the keys „PROG" and „APP" kann also be released. Following Display will appear:
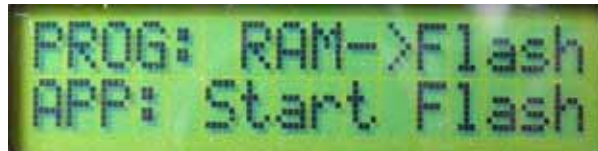
Due to the the program will be stored to the flash the key „PROG" must be pressed. Following safety message will appear:

By choosing the key "APP" (No) the previous display will appear and nothing happens. By pressing the key „PROG" the program will be copied from RAM and stored to the flash. While copiing LED P4.0 will lit and following display appears:

Now the program has been stored to the non volatile memory and can re activated all the time with previous described steps by pressing key „APP" after first display menu.

To start or load the program from the flash the key „APP" must pressed. LED P4.0 will lit and following display appears:
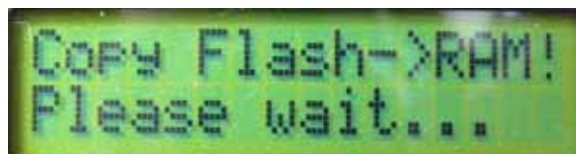
The program will start automaticaly after finished copy procedure. Furtheron, if no display routines are used in the code (like AnyBus-S/M samplecode) the last display screen will stay.

5. Masters for fieldbus systems

When developing and testing programs for AnyBus-S modules, a master is required for the respective bus system. In addition to standard SPS masters, HMS recommends the use of so-called master simulators. These are simple fieldbus master systems with small limitations which simulate bus communication with the respective fieldbus system and allow the exchange of data between master and slave. Master simulators are currently available for Profibus DP, Profibus DPV1, DeviceNet and Interbus- S.
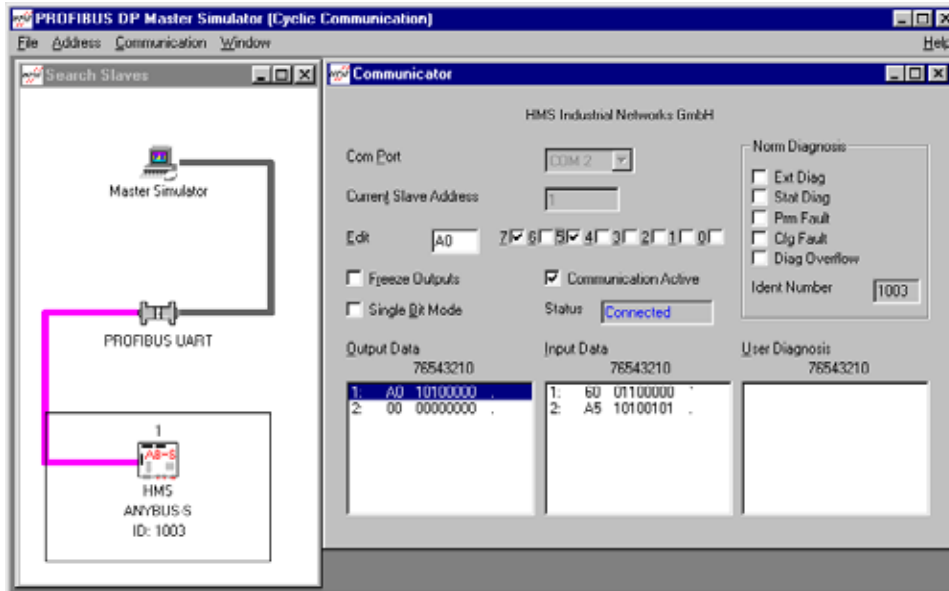
Figure 14: Profibus DP Master simulator

The supplied HMS CD-ROM also includes a simple freeware Modbus/TCP Server which can be used to test communication between an AnyBus-S Ethernet module / AnyBus IC on the Evaluation Board and a PC. Please observe the installation instructions!
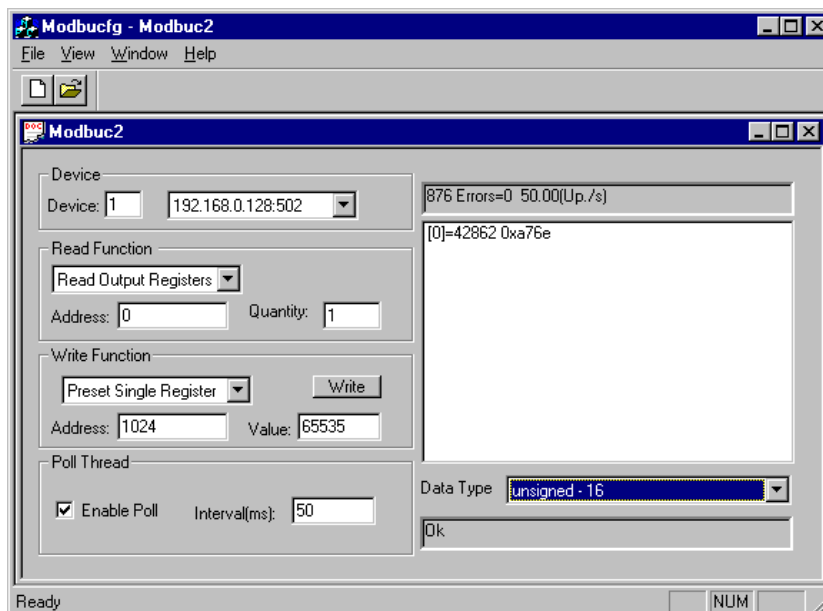
Figure 24: Freeware Modbus/TCP Server

> **!** **The supplied Modbus/TCP Server Software is demonstration software which is freely available in the Internet. HMS cannot provide support for installation and commissioning.**

6. Appendices

6.1 Diagram of Sample code
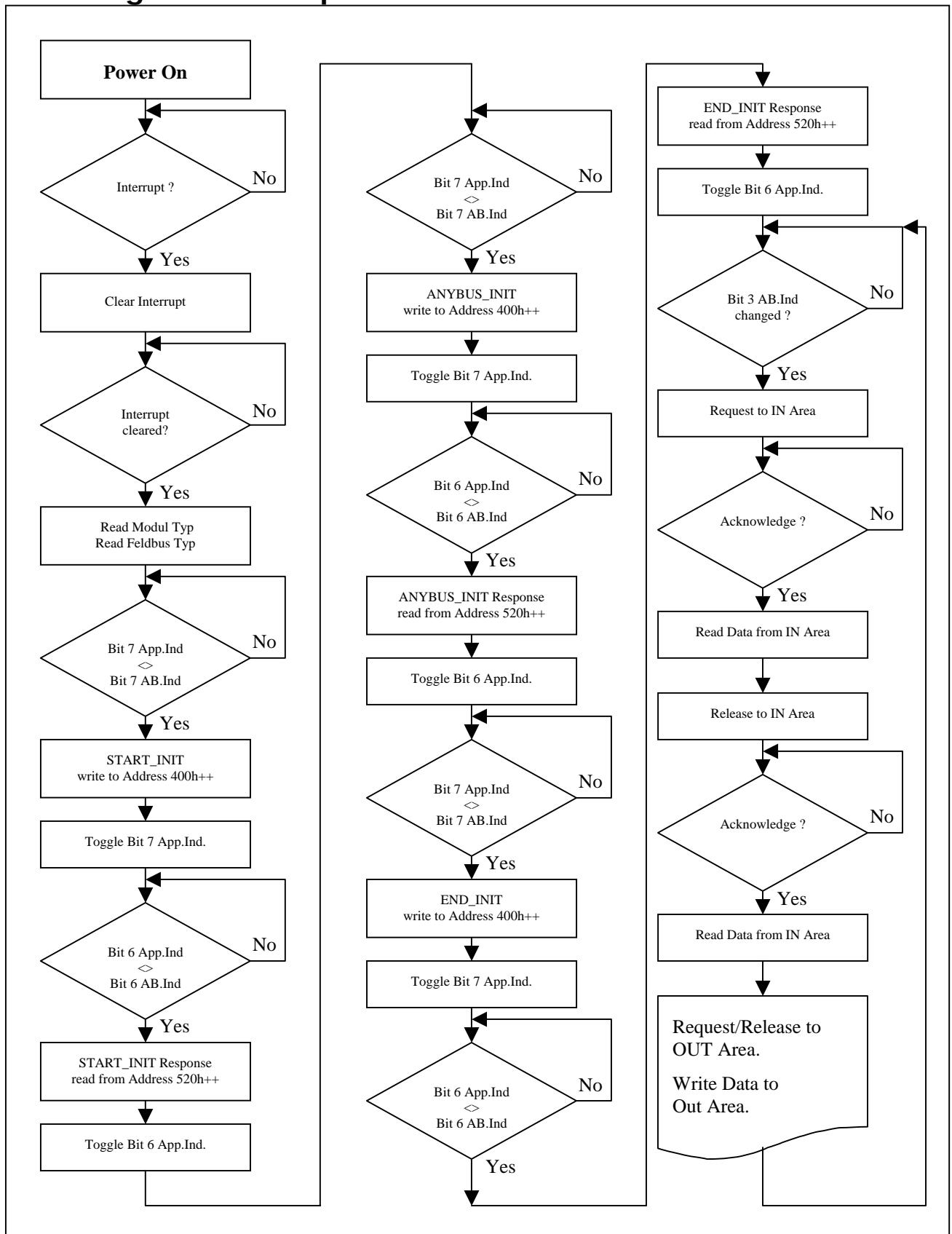
Figure 25: Flow chart initialisation & data transmission

6.2 Sample Code

The sample code is included at the AnyBus-S Eval Board CD-Rom and available in different variations:

- Polled data transmission

- Interrupt driven data transmission

Each program is prepared to run at the Keil C51 compiler environment and the Eval Board. It is downloadable with the monitor functionality described in chapter 4.4.

For further questions and inspirations we have in the Club AnyBus an open ear for you any time .

http://www.hms-networks.com/club_anybus/club_area.asp

6.3 Technical Data

Measurement	
PCB	Standard Euro Format: 160 mm x 100 mm
Case	Phoenix Case UM100 125 mm x 162 mm
Complete height with connected AnyBus module	app. 50 mm (depending from fieldbus type)

6.4 Abbreviations

Important abbreviations used in this manual:

ABC	AnyBus ComAdapter
ABS	AnyBus-S
ACK	Acknowledge
DPRAM	Dual-Port RAM
EVB; EvalBoard	AnyBus-S Evaluation Board
μC	Microcontroller (80XXX)
LED	Light Emitting Diode
LSB	Least Significant Bit
MSB	Most Significant Bit
NAK	Negative Acknowledge
NC	Not Connected
PAR	Parallel Interface
RO	Read Only
R/W	Read / Write
SER	Serial Interface
TBD	To Be Defined

6.5 Supported AnyBus-S module types

The following AnyBus-S module types are suitable for use with the Evaluation Board. Special AnyBus-S module types are also supported (but see note below the table).

Description	Order Nr.	Fieldbus Type	Interface
ABS-PDP	AB4005	Profibus- DP	Parallel Interface
AVS-PDP	AB4027	Profibus- DP	Serial Interface
ComAdapter	ABSCOM-PDP	Profibus- DP	Serial Interface
Communicator	AB7000	Profibus- DP	Serial Interface
ABIC-PDP	AB6000	Profibus- DP **	Serial Interface
ABS-ETH	AB4078	10 Mbit Ethernet Modbus/TCP	Parallel Interface
ABS-ETH	AB4172	10/100 Mbit Ethernet Modbus/TCP+IT	Parallel Interface
ABS-ETH	AB4173	10/100 Mbit Ethernet Modbus/TCP+Ethernet/IP+IT *	Parallel Interface
Communicator	AB7005	10/100 Mbit Ethernet Modbus/TCP+IT	Serial Interface
ABIC-ETN	AB6002	10/100 Mbit Ethernet Modbus/TCP+IT *,**	Serial Interface
ABS-COP	AB4003	CanOpen	Parallel Interface
ABS-COP	AB4025	CanOpen	Serial Interface
ComAdapter	ABSCOM-COP	CanOpen	Serial Interface
Communicator	AB7003	CanOpen	Serial Interface
ABS-DEV	AB4004	DeviceNet	Parallel Interface
ABS-DEV	AB4026	DeviceNet	Serial Interface
ComAdapter	ABSCOM-DEV	DeviceNet	Serial Interface
Communicator	AB7001	DeviceNet	Serial Interface
ABIC-DEV	AB6001	DeviceNet **	Serial Interface
ABS-CNT	AB4007	ControlNet	Parallel Interface
ABS-MBP	AB4080	Modbus Plus	Parallel Interface
Communicator	AB7002	Modbus Plus	Serial Interface
ABS-IBS	AB4006	Interbus-S	Parallel Interface
AB-IBS	AB4028	Interbus-S	Serial Interface
ComAdapter	ABSCOM-IBS	Interbus-S	Serial Interface
AB-IBFO	AB4034	Interbus Fibre Optic	Parallel Interface
AB-IBFO	AB4081	Interbus Fibre Optic	Serial Interface
AB-LON	AB4079	LonWorks *	Parallel Interface
Communicator	AB7004	LonWorks	Serial Interface

Please note that the Evaluation Board is only suitable for AnyBus modules with the following mechanical design:
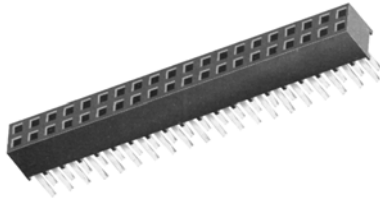Bottom side (solder side): Application connector
Top Side (component side): Terminator Switch, Fieldbus connector and Address switch.

* in preparation
** connection to EvalBoard via additional hardware

6.6 Recommended connector & accessory manufactures

6.6.1 AnyBus-S connector

- 34 pins
- two rows
- 2 mm grid

Europe	Schweden	Headquarter
Molex Services GmbH Dingolfinger Straße 4 D-816 73 Munich, Germany Tel.: +49 - 89 - 413 092 - 0 Fax : +49 - 89 - 401 527	Cll Connectors & Cables AB Rubanksgatan 3 S-741 71 Knivsta-AR, Sweden Tel.: +46 - 18 - 34 94 60 Fax +46 - 18 - 34 94 70	Molex Inc. 2222 Wellington Court, Lisle, Illinois 605 32 – 1682, U.S.A. Tel.: +1 – 630 – 969 – 4550 Fax : +1 – 630 – 968 – 8356
Europe	Schweden	Headquarter
Samtec United Kingdom Inc. 117 Deerdykes View Westfield, Cumbernauld Scotland G68 9HN Tel.: +44 - 1236 - 739 292 Fax : +44 - 1236 - 727 113	Freber Elektronik AB Solkraftsvägen 31 S-135 70 Stockholm, Sweden Tel.: + 46 - 8 - 712 04 80 Fax +46 - 8 - 712 92 47	Samtec Inc. P.O. Box 1147 New Albany, IN 47151-1147 Tel.: +1 - 812 - 944 - 6733 Fax : +1 - 812 - 948 – 5047
Europe	Schweden	Headquarter
Harwin plc Fitzherbert Road, Farlington, Portsmouth, Hants PO6 1RT, UK Tel.: +44 - 1705 - 370451 Fax : +44 - 1705 – 314 590	Ingenjörsfirman Gunnar Pettersson Box 117 S-123 22 Farsta, Sweden Tel.: +46 - 8 - 930280 Fax +46 - 8 - 949930	Harwin Inc. P.O Box 319 New Albany, IN 47151, U.S.A. Tel.: +1 - 812 - 285 – 0055 Fax : +1 - 812 - 285 - 0056

6.6.2 Power supply connector

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- 2 pins
- 2,54 mm grid

Europe	Schweden	Headquarter
Phoenix Contact GmbH & C0. Flachsmarktstraße 8 32825 Blomberg Tel.: +49 – 5235 – 300 Fax: +49 – 5235 – 341200 WEB: www.phoenixcontact.com		Phoenix Contact GmbH & C0. Flachsmarktstraße 8 32825 Blomberg Tel.: +49 – 5235 – 300 Fax: +49 – 5235 – 341200 WEB: www.phoenixcontact.com

6.6.3 Expansion connector for own applications

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- acc. to DIN41612
- 64 pins
- two rows
- 2,54 mm grid

Europe	Schweden	Headquarter
RS Components GmbH Hessenring 13b 64546 Mörfelden-Walldorf Tel.: ++49 – 6105 – 401 – 234 Fax.: ++49 – 6105 – 401 – 100 WEB: www.rs-components.de	RS Components AB Box 15 162 11 Vällingby Tel.: ++46 – 8 - 445 – 8900 Fax.: ++46 – 8 – 687 – 1152 WEB: www.rs-components.com	RS Components International PO Box 99, Corby, Northants NN17 9RS, United Kingdom Tel.: ++44 – 1536 – 201234 Fax.: ++44 – 1536 – 204237 WEB: www.rs-components.com
Conrad electronic GmbH Klaus-Conrad-Straße 1 92240 Hirschau Tel.: ++49 – 9604 – 4089 – 88 Fax.: ++49 – 9604 – 4089 – 36 WEB: www.conrad.de		Conrad electronic GmbH Klaus-Conrad-Straße 1 92240 Hirschau Tel.: ++49 – 9604 – 4089 – 88 Fax.: ++49 – 9604 – 4089 – 36 WEB: www.conrad.de

6.6.4 Fuse

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- 250 V
- 800 mA
- inertia
- RM 5,08 Case

Europe	Schweden	Headquarter
Conrad electronic GmbH Klaus-Conrad-Straße 1 92240 Hirschau Tel.: ++49 – 9604 – 4089 – 88 Fax.: ++49 – 9604 – 4089 – 36 WEB: www.conrad.de		Conrad electronic GmbH Klaus-Conrad-Straße 1 92240 Hirschau Tel.: ++49 – 9604 – 4089 – 88 Fax.: ++49 – 9604 – 4089 – 36 WEB: www.conrad.de
Farnell Electronic Components GmbH Keltenring 14 82041 Oberhaching Tel.: ++49 – 89 – 613 – 93939 Fax: ++49 – 89 – 613 – 5901 WEB: www.farnell.com		Farnell Electronic Components GmbH Keltenring 14 82041 Oberhaching Tel.: ++49 – 89 – 613 – 93939 Fax: ++49 – 89 – 613 – 5901 WEB: www.farnell.com

6.6.5 Power Supply

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- Wide range power supply
- 100 V-250 V Primary
- 5V Secondary
- Changeable connector for US,EU,JP...

Europe	Schweden	Headquarter
RS Components GmbH Hessenring 13b 64546 Mörfelden-Walldorf Tel.: ++49 – 6105 – 401 – 234 Fax.: ++49 – 6105 – 401 – 100 WEB: www.rs-components.de	RS Components AB Box 15 162 11 Vällingby Tel.: ++46 – 8 - 445 – 8900 Fax.: ++46 – 8 – 687 – 1152 WEB: www.rs-components.com	RS Components International PO Box 99, Corby, Northants NN17 9RS, United Kingdom Tel.: ++44 – 1536 – 201234 Fax.: ++44 – 1536 – 204237 WEB: www.rs-components.com
FRIWO Gerätebau GmbH Postfach 1164 48342 Ostbevern Tel.: ++49 – 2532 – 81 – 0 Fax.: ++49 – 2532 – 81 – 112 WEB: www.friwo.de		FRIWO Gerätebau GmbH Postfach 1164 48342 Ostbevern Tel.: ++49 – 2532 – 81 – 0 Fax.: ++49 – 2532 – 81 – 112 WEB: www.friwo.de

6.6.6 Keil µVision2 Development Tool

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- Complete development environment for AnyBus-S Evaluation Board
- Assembler, C-Compiler, Debuger, Simulator,
- Supports many 51 Derivates

Europe	Schweden	Headquarter
Keil Elektronik GmbH Bretonischer Ring 15 85630 Grasbrunn – München Tel.: ++49 – 89 – 456040 – 0 Fax: ++49 – 89 – 468162 WEB: www.keil.com		Keil Elektronik GmbH Bretonischer Ring 15 85630 Grasbrunn – München Tel.: ++49 – 89 – 456040 – 0 Fax: ++49 – 89 – 468162 WEB: www.keil.com

HMS

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Send your comments to: *HMS Industrial Networks AB*
Pilefeltsgatan 93-95
302 50 Halmstad
SWEDEN

You may also mail or fax your comments:

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Fax: +49 (0)271 96472 10